

CLAIMS

1. An ulcer, lymphoedema and deep vein thrombosis treatment device comprising:
a drive unit adapted to deliver mechanical vibrations at its surface in three orthogonal
5 directions at a frequency in each orthogonal direction of between 15 and 75 Hz and with an
amplitude in each orthogonal direction of between 0.1 and 0.5 mm;
a pad connected to said drive unit; and
pressure applying means by which the pad may be pressed against the limb of the
animal or human.
- 10 2. A device according to claim 1, wherein said pressure applying means comprises a
strap by means of which the pad may be secured to said limb.
3. A device according to claim 1, wherein the area over which a given level of pressure
in excess of 1333 Pa (10 mmHg) is applied to the limb by the pad is increased by at least
25%, preferably 50%, by application of said pressure applying means.
- 15 4. A device according to claim 3, wherein the area over which a given level of pressure
in excess of 2666 Pa (20 mmHg) is applied to the limb by the pad is increased by at least
25%, preferably 50%, by application of said pressure applying means.
5. A device according to claim 1, wherein said drive unit is substantially cylindrical and
wherein the drive unit comprises a casing mounting a motor having an armature parallel the
20 axis of the cylinder.
6. A device according to claim 5, wherein said motor drives an eccentrically mounted
weight to provide oscillations of the casing in a radial plane, and wherein said motor is
mounted through flexible mountings in the casing so that a component of the radial
oscillations is created in an axial direction of the armature.

7. A device according to claim 5, wherein the motor is electrically powered from mains AC electricity, the drive unit including digital control means to ensure smooth supply of energy to the motor.
8. A device according to claim 7, wherein said digital control means comprises:
- 5 a detector for each zero crossing point of the AC power supply and adapted to disconnect power from the motor when said crossing point is detected;
- a timer comprising a counter started by said detector;
- a comparator to compare the count of said counter with a number stored in a memory and to switch power to the motor when said count equals said number.
- 10 9. A device according to claim 8, wherein a low voltage transformer is disposed between the power supply and detector.
10. A device according to claim 9, wherein a rectifier converts the power supply to the motor to DC and the motor is a DC motor.
11. A device according to claim 8, wherein said number is adjustable to vary the power
- 15 supplied to the motor, and hence its speed of rotation and hence said frequency.
12. A device according to claim 8, wherein said counter is capable of providing about 250 counts in each half cycle of the power supply.
13. A device according to claim 1, wherein said pad comprises a frame rigidly fixed to the drive unit to transmit vibrations into the pad, and cushioning material covering the frame.
- 20 14. A device according to claim 1, wherein said pad is elongate, of length between 300 and 500 mm and width between 100 and 200 mm, said drive unit being mounted at one end of said pad.

15. A device according to claim 14, wherein the pad tapers from the end at which the drive unit is disposed.
16. A device according to claim 14, wherein said pressure applying means comprises a strap by means of which the pad may be secured to said limb and wherein the strap is
5 disposed about half way along the length of the pad.
17. A device according to claim 1, wherein the drive unit operates at a frequency of between 30 and 60 Hz.
18. A device according to claim 1, further comprising a cover.
19. A device according to claim 18, wherein said cover is in the form of an open pouch to
10 receive said pad and drive unit, and fastening means to close the pouch about the pad and drive unit, at least one opening in the cover being provided to permit cooling airflow into the drive unit.
20. A device as claim in claim 19, wherein said cover comprises a deep pouch to receive the pad and a flap on a front side of the pouch extending from the lip thereof and having a
15 first fastener along its edge remote from said front lip and adapted to detachably fasten to a second fastener along the lip of the pouch on its rear side, two of said openings thereby being defined between each free edge of the flap and the lip of the pouch between its front and rear sides respectively.
21. A device according to claim 20, wherein one of said fasteners comprises a strip of
20 hooked material while the other comprises a strip of hooped material, so that pressing said materials together effects a releasable connection.

22. A device according to claim 18, wherein the cover comprises a sheet of material having means to gather its edges on an underside of the pad, and render the sheet taught on an operative side of the pad against which a patient's limb is intended to lie.
23. A device according to claim 22, wherein said pressure applying means comprises a
5 strap by means of which the pad may be secured to said limb, and wherein the cover comprises means to fasten the strap to the cover, and hence to the pad, for the purpose of providing said pressure applying means.
24. A device according to claim 23, wherein said strap fastening means comprises strips of hooked or hooped material along the sides of the cover to which the strap, comprising
10 respectively hooped or hooked material, may be fastened.
25. A device according to claim 22, wherein at least one hole is provided in the sheet to permit the drive unit to protrude therethrough.
26. A device according to claim 18, wherein said pressure applying means comprises a strap by means of which the pad may be secured to said limb, and wherein said strap is
15 integrally formed with the cover.
27. A device according to claim 26, wherein there are two straps spaced along the cover.
28. A device according to claim 26, wherein the or each strap is connected at one end to a side edge of the cover and at its other end is provided with a third fastener, the other side edge of the cover being provided with a complimentary fourth fastener.
- 20 29. A device according to claim 28, wherein the fourth fastener extends along the length of the cover to vary the possible disposition of the or each strap when the third and fourth fasteners are engaged.

30. A device according to claim 28, wherein the third and fourth fasteners comprise hooped and hooked fabric materials.
31. A device according to claims 29, wherein the fourth fastener comprises a strip of such material along a significant part of the length of the side edge of the cover so that the or each
5 strap can vary in its position of attachment to the other side of the cover.
32. A device according to claim 18, wherein the cover is of impervious material to prevent liquid from penetrating and contaminating a pad received within the cover.
33. A method of treatment of ulcers, lymphoedema and prophylactically of deep vein thrombosis, of the human or animal body, which method comprises the step of subjecting the
10 body in the area of the ulcer, lymphoedema or deep vein thrombosis, as the case may be, to mechanical vibrations for an effective period of time, said vibrations having a frequency of between 15 and 75 Hz, and an amplitude of between 0.1 and 0.5 mm.
34. The method of claim 33, wherein said vibrations have components in three orthogonal directions, said frequency being the same or different in each direction, and said
15 amplitude being the same or different in each direction.
35. The method of claim 33, wherein said period is more than fifteen minutes, ideally about thirty minutes.
36. The method of claim 33, wherein the treatment is repeated three times a day.
37. The method of claim 33, employing a device according to claim 1.
- 20 38. The method of claim 37, wherein the device is applied by said pressure applying means to a limb of a patient suffering, or potentially suffering, one or more of said conditions and so that, in use, the device delivers vibrations in the limb of the patient at a frequency of between 20 and 50 Hz, and with an RMS acceleration in the axial direction of

the tibial or fibular bone, as the case may be, of between 5 and 15 ms⁻², and in a radial plane with respect to the tibial or fibular bone, as the case may be, with an RMS acceleration of between 2 and 5 ms⁻².

39. The method of claim 38, wherein the device delivers vibrations in the leg of the patient at a frequency of about 30 Hz, and with an RMS acceleration in the axial direction of the tibial or fibular bone, as the case may be, of about 10 ms⁻², and in a radial plane with respect to the tibial or fibular bone, as the case may be, with an RMS acceleration of between 2 and 5 ms⁻².

40. The method of claim 33, wherein pressure is applied to said area of the body by the device subjecting the body to said mechanical vibrations.

41. The method of claim 37, wherein pressure is applied to said area of the body by the device subjecting the body to said mechanical vibrations, and wherein said pressure is applied by the pad through application of said pressure applying means such as to increase the area of the body subject to pressure in excess of 10 mmHg without application of said pressure applying means by at least 25%, and preferably by at least 50%.

42. A cover for a vibratory massage device according to claim 1, said cover comprising an open-pouch to receive said pad and drive unit, fastening means to close the pouch about the pad and drive unit, at least one opening in the cover being provided to permit cooling airflow into the drive unit.

43. A cover according to claim 42, wherein said cover comprises a flap on a front side of the pouch extending from the lip thereof and having a first fastener along its edge remote from said front lip and adapted to detachably fasten to a second fastener along the lip of the

pouch on its rear side, two of said openings thereby being defined between each free edge of the flap and the lip of the pouch between its front and rear sides respectively.

44. A cover according to claim 43, wherein one of said fasteners comprises a strip of hooked material while the other comprises a strip of hooped material, so that pressing said materials together effects a releasable connection.

45. A cover according to claim 42, wherein said pressure applying means of the device comprises a strap by means of which the pad may be secured to said limb, and wherein said strap is integrally formed with the cover.

46. A cover according to claim 45, wherein there are two straps spaced along the cover.

47. A cover according to claim 45, wherein the or each strap is connected at one end to a side edge of the cover and at its other end is provided with a third fastener, the other side edge of the cover being provided with a complimentary fourth fastener.

48. A cover according to claim 47, wherein the fourth fastener extends along the length of the cover to vary the possible disposition of the or each strap when the third and fourth fasteners are engaged.

49. A cover according to claim 47, wherein the third and fourth fasteners comprise hooped and hooked fabric materials.

50. A cover according to claims 47, wherein the fourth fastener comprises a strip of such material along a significant part of the length of the side edge of the cover so that the or each strap can vary in its position of attachment to the other side of the cover.

51. A cover according to claim 42 comprising impervious material to prevent liquid from penetrating and contaminating a pad received within the cover.

52. A cover for a vibratory massage device according to claim 1, said cover comprising a sheet of material having means to gather its edges on an underside of the pad when disposed thereon, and render the sheet taught on an operative side of the pad against which a patient's limb is intended to lie, the cover further comprising means to fasten a strap to the cover, and
5 by means of which pressure can be applied between the patient's limb and the pad covered by said cover.

53. A cover according to claim 52, wherein said strap fastening means comprises strips of hooked or hooped material along the sides of the cover to which the strap, comprising respectively hooped or hooked material, may be fastened.

10 54. A cover according to claim 52, wherein at least one hole is provided in the sheet to permit the drive unit to protrude therethrough.

55. A cover according to claim 52, wherein said pressure applying means of the device comprises a strap by means of which the pad may be secured to said limb, and wherein said strap is integrally formed with the cover.

15 56. A cover according to claim 55, wherein there are two straps spaced along the cover.

57. A cover according to claim 55, wherein the or each strap is connected at one end to a side edge of the cover and at its other end is provided with a third fastener, the other side edge of the cover being provided with a complimentary fourth fastener.

58. A cover according to claim 57, wherein the fourth fastener extends along the length
20 of the cover to vary the possible disposition of the or each strap when the third and fourth fasteners are engaged.

59. A cover according to claim 57, wherein the third and fourth fasteners comprise hooped and hooked fabric materials.

60. A cover according to claims 57, wherein the fourth fastener comprises a strip of such material along a significant part of the length of the side edge of the cover so that the or each strap can vary in its position of attachment to the other side of the cover.
61. A cover according to claim 52 comprising impervious material to prevent liquid from penetrating and contaminating a pad received within the cover.
62. Use of a drive unit and a pad in the manufacture of a device for the treatment of an ulcer, lymphoedema or deep vein thrombosis of a patient, wherein said drive unit is adapted to deliver mechanical vibrations at its surface in three orthogonal directions at a frequency in each orthogonal direction of between 15 and 75 Hz and with an amplitude in each orthogonal direction of between 0.1 and 0.5 mm, and wherein said pad is connected to said drive unit.
63. A kit of parts comprising a cover suitable for covering a device according to claim 1, and a strap suitable for applying pressure between the pad of the device and a patient's leg.